



## ARPA-E's 37 Projects Selected From Funding Opportunity Announcement #1

**Project Title:** Conditionally Activated Enzymes Expressed in Cellulosic Energy Crops  
**Organization:** Agrivida  
**Funding Amount:** \$4,565,800  
**Website:** [www.agrivida.com](http://www.agrivida.com)

### Brief Description of Project

Agrivida is developing an innovative cellulosic biofuels technology using engineered plant traits. Agrivida's objective is to reduce oil consumption and greenhouse gas emissions (GHGe) by engineering domestic biomass crops for low-cost production of fuels and chemicals. The research aims to develop cell wall degrading (CWD) enzymes as inactive precursors that can be produced at high concentration within the plant itself. By engineering the enzymes, their hydrolytic activity will be dormant during plant growth and will not impair plant development or yield. Once the crop is harvested, the engineered enzymes can be activated by using the conditions of the biofuels production process. The activated CWD enzymes are distributed throughout the plant material and capable of converting the plant cell walls into fermentable sugars. This technology would relieve the challenges of plant cell wall degradation, enabling a profitable bio-products industry based on cellulosic feedstock conversion. Such an industry can sustainably provide the resources to make >16B gallons of domestic biofuels from non-food crops with significantly reduced greenhouse gas emissions (GHGe), while also benefiting animal feed production and other related industries.

### Why ARPA-E Funding and Not Private Capital

While this line of research holds great promise to revolutionize the production of cellulosic biofuels, it is highly risky. It involves intricate and very complex protein engineering, plant modification, and process development. Such a combination of risk factors is difficult for private capital to fund in the current economic environment.

### Uniqueness/Benefits of Technology

Agrivida's technology directly addresses the two fundamental problems that currently prevent widespread commercialization of cellulosic biofuels: pretreatment costs and enzyme costs. By building the enzymes into the plants, Agrivida will enable low cost production of fermentable sugars from cellulosic biomass. This technology may allow the retrofitting of current corn grain ethanol facilities to process cellulosic biomass. Furthermore, because the enzymes are dormant when in the plant, Agrivida believes this technology is the safest form of plant molecular modification outside of traditional breeding.

### Addressable Market & Potential Customers

Agrivida's technology addresses key challenges in addressing the commercialization of cellulosic biofuels. This market is expected to grow to 16B gal of advanced, low emissions, biofuels in the U.S. by 2022.



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### Key Team Member Bios

Agrivida's management team is well qualified to pursue this promising line of research. Dr. Michael Raab and Dr. Jeremy Johnson both have Ph.D.s in chemical engineering from MIT, possess significant industry experience in molecular biology and process engineering, and have been leading Agrivida since its incorporation in 2003. Dr. Michael Lanahan received his Ph.D. from Washington University in St. Louis and formerly managed a group of over 20 researchers in biofuels trait development at Syngenta, in NC. Mark Wong, CEO, has spent his career in agribusiness at Agracetis, Agrigenetics, and Emergent Genetics. Members of the technical and management teams were assembled from top institutions including MIT, Harvard, TIGR, Merck, Cargill, Monsanto, and Syngenta.

### Miscellaneous

Agrivida investors include Kleiner, Perkins, Caufield & Byers, DAG, Northgate, Prairiegold Ventures, incTank, and Presidio Ventures.

### Schematics/Photos of Technology or Personnel

#### The Agrivida Team



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